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07/14/00
JC542 U.S. PTO
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Date: July 14, 2000
Docket No.: 0630-1127P

Assistant Commissioner for Patents
Box PATENT APPLICATION
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the patent application of

Inventor(s): PAIK, Woo H.
KANG, Bae G.; PARK, Tae J.
LEE, Seng W.

For: BROADCASTING SERVICE SYSTEM USING MOBILE COMMUNICATION
TERMINAL

Enclosed are:

- ☒ A specification consisting of 39 pages
- ☒ 7 sheet(s) of formal drawings
- ☒ An assignment of the invention
- ☒ Certified copy of Priority Document(s)
- ☒ Executed Declaration ☒ Original ☐ Photocopy
- ☐ A verified statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27
- ☒ Preliminary Amendment
- ☐ Information Disclosure Statement, PTO-1449 and reference(s)

Other _____

The filing fee has been calculated as shown below:

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FOR	NO. FILED	NO. EXTRA	RATE	FEE		RATE	FEE
BASIC FEE	***** ***** *****	***** ***** *****	***** ***** *****	\$690.00	or	**** **** ****	\$345.00
TOTAL CLAIMS	35 - 20 =	15	x18 = \$	270.00	or	x 9 = \$	0.00
INDEPENDENT	8 - 3 =	5	x78 = \$	390.00	or	x 39 = \$	0.00
MULTIPLE DEPENDENT CLAIM PRESENTED <u>no</u>				+260 = \$	or	+130 = \$	0.00
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X A check in the amount of \$1,390.00 to cover the filing fee and recording fee (if applicable) is enclosed.

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Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By Thomas S. Auchterlone #37275

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IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: PAIK, Woo Hyun et al
Appl. No.: NEW Group: UNKNOWN
Filed: July 14, 2000 Examiner: UNKNOWN
For: BROADCASTING SERVICE SYSTEM USING MOBILE
 COMMUNICATION TERMINAL

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, DC 20231

July 14, 2000

Sir:

The following preliminary amendments and remarks are respectfully submitted in connection with the above-identified application.

AMENDMENTS

IN THE CLAIMS:

Please amend the claims as follows:

Claim 28: Line 1, delete "or claim 27"

Claim 31: Line 1, delete "or claim 30"

Claim 35: Line 1, delete "claim 33 or 34"

REMARKS

The amendment to the claims is merely to delete multiple dependencies and to place the application into better form prior to examination. Favorable action on the above-identified application is respectfully requested.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

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BROADCASTING SERVICE SYSTEM USING MOBILE COMMUNICATION TERMINAL

BACKGROUND OF THE INVENTION

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1. Field of the Invention

The present invention relates to a system which is capable of receiving a broadcasting signal and telephone signal, and watching and listening it on a mobile communication terminal, and in particular to a system which is capable of receiving a video signal and audio signal, decoding it, and displaying the decoded signal on the monitor of the mobile communication terminal.

2. Description of the Prior Art

Organic combination or link between the conventional personal mobile communication system and digital television system for maximizing advantages of the both systems are not accomplished. In addition, in the digital television system, various additional information with high quality images are only provided to digital television sets. In other words, the conventional personal mobile communication system such as a cellular phone can not transmit and receive video, audio and character information.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a broadcasting service system using a mobile communication terminal which is capable of watching

television broadcasting on a mobile communication subscriber terminal, when a mobile communication network subscriber wants to watch broadcasting, the system is capable of recognizing and answering the subscriber request, providing broadcasting information, and controlling digital and analog broadcasting signals to transmit on the subscriber terminal through the mobile communication network.

The other object of the present invention is to provide a subscriber terminal, when analog and digital moving picture broadcasting signals are converted according to signal standard of the mobile communication network, which is capable of receiving and restoring the converted analog and digital moving picture information, and outputting images and sounds.

The another object of the present invention is to provide a broadcasting signal selecting mean which is capable of selecting broadcasting information, receiving and restoring the selected broadcasting signal in order to watch digital and analog television broadcasting.

The another object of the present invention is to provide a broadcasting service method using a mobile communication terminal which is capable of converting digital and analog broadcasting signals in real time according to a transmission standard of the mobile communication network, transmitting the converted broadcasting signals through the mobile communication network, watching the transmitted television signals on the subscriber terminal.

To achieve the objects, the broadcasting service system using the mobile communication terminal includes a converting mean which receives a video and audio signal provided from the moving picture information and converts the video and audio signal, and a transmitting mean which transmits the converted video and audio signal to a subscriber through a certain transmission line of the mobile

communication network.

To achieve the objects of the present invention, in order to receive broadcasting signals, the mobile communication terminal includes a receiving mean which receives the digital video and audio data, a decoding mean which
5 decodes the received digital video and audio data, and outputting mean which outputs the decoded video and audio signal.

To achieve the objects of the present invention, the mobile communication subscriber terminal includes a broadcasting reception mean which receives the broadcasting signal as a moving picture information, a communication process
10 mean which receives, restores a call signal provided to a subscriber and outputs it through the mobile communication network, and coding-outputs a transmitting call signal through the mobile communication network, a decoding mean which restores the received broadcasting signal by the broadcasting reception mean, an
15 output mean which outputs the broadcasting signal restored by the decoding mean to a terminal to be watched, a selecting mean which selects the broadcasting signal reception mode and mobile communication call mode.

To achieve the objects of the present invention, the broadcasting service method using the mobile communication terminal includes a converting process which converts the broadcasting signal having the digital video and audio data into
20 a data agreed with the signal and transmission standard of the mobile communication network, and a transmission process which transmits the converted digital video and audio data to the subscriber through a certain transmission channel of the mobile communication network.

25 BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic block diagram illustrating the structure of a broadcasting service system using a mobile communication terminal according to the preferred embodiment of the present invention. .

5 Figure 2 is a block diagram illustrating the broadcasting service system using the mobile communication terminal according to the preferred embodiment of the present invention.

Figure 3 is a block diagram illustrating the operation of the format converter of the present invention. .

10 Figure 4 is a block diagram illustrating the operation of the EPG (Electronic Program Guide) converting processor of the present invention.

Figure 5A is a block diagram illustrating the operation of the digital broadcasting service system of the present invention in relation to a video and audio information process and mobile communication network matching.

15 Figure 5B is a block diagram illustrating the operation of the analog broadcasting system of the present invention in relation to a video and audio information process and mobile communication network matching.

Figure 6 is a block diagram illustrating the operation of the transcoder of the present invention.

20 Figure 7 is a block diagram illustrating the operation of the mobile communication terminal of the present invention.

Figure 8 is a flow chart illustrating the control process of the broadcasting service of the present invention.

25 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 is a schematic block diagram illustrating the structure of a broadcasting service system using a mobile communication terminal of the preferred embodiment of the present invention. As depicted in figure 1, a television broadcasting system 101 transmits a video and audio signal to a subscriber terminal 104 through a satellite network 102, a television broadcasting network 103 or a cable network (Cable). The subscriber terminal 104 receives the video and audio signal, and outputs an image and sound by decoding the video and audio signal.

Herein, the television broadcasting system 101 is moving picture and audio information, it may be an analog television broadcasting system, digital television broadcasting system, or other moving picture information.

The conventional analog broadcasting system includes a NTSC (National Television System Committee), a PAL (Phase Alternation Line), and a SECAM (Sequential Couleur Avec Memoire) broadcasting method which are commonly used.

And the conventional digital broadcasting system includes a ATSC (Advanced Television Systems Committee) method of America, a DVB (digital Video Broadcasting) method of Europe, and a digital broadcasting method of Japan. Herein, the ATSC method of America adopts a MPEG2 (Moving Picture Experts Group2), Dolby AC3 and 8VSB, and DVB method of Europe adopts a MPEG2 (Moving Picture Experts Group2) and an OFDM (Orthogonal Frequency Division Multiplexing).

As described above, in the digital television broadcasting system, the video and audio signal are provided as a compressed digital data (bit stream).

Herein, the compressed digital data has a protocol in relation to reception and transmission, accordingly the digital broadcasting information agreed with the protocol includes the video and audio data and EPG (Electronic Program Guide) and additional data, and are processed together.

5 In figure 1 of the present invention, processing of the digital video signal compressed as the MPEG2 (Moving Picture Experts Group2) is described.

When the television broadcasting system 101 is the digital television broadcasting system, the video information provided to the digital television is a compressed-encoded information as the MPEG2 (Moving Picture Experts Group2) standard, accordingly a format converter 105 for converting the compressed-
10 encoded information into a MPEG4 (Moving Picture Experts Group4) agreed with an image standard of the mobile communication network is included.

Meanwhile, when the television broadcasting system 101 is the analog television broadcasting system, the television broadcasting system 101 (moving
15 picture provider) or the format converter 105 can have a converting mean which converts the provided video information into a digital signal having a certain format agreed with the mobile communication network transmission standard.

The format converter 105 is inputted the MPEG2 (Moving Picture Experts Group2) videotex provided from the television broadcasting system 101, and
20 format-converts the MPEG2 videotex into the MPEG4 (Moving Picture Experts Group4) videotex agreed with the mobile communication network.

The format converter 105 will be described with reference to the accompanying figure 5B.

The format converter 105 can convert the MPEG2 (Moving Picture Experts
25 Group2) videotex into H.26L, H.263 or H.26X format. As far as the converted

format agrees with the mobile communication network, there is no limitation in the format.

The format converter 105 exchanges the information needed in the format conversion with the television broadcasting system 101 through a transmission line 107.

The format converter 105 will be described in detail.

For example, the bit rate of the digital television adapts high speed broadcasting band such as 19.236Mbps of HD level or 6Mbps of SD level.

However, the data transmission rate of IMT-2000 is maximum 144Kbps or 2Mbps (in case of a Pico Cell) according to a Cell, likewise, on the mobile communication network which can process maximum 2Mbps two-way signal, transmitting the digital television signal directly to a cellular phone or PCS is impossible due to the distinctive character of the mobile communication network.

Therefore the format converting process which converts the MPEG2 digital television signal into the signal agreed with the mobile communication network such as the MPEG4 (Moving Picture Experts Group4) is required, the format converter 105 performs transcoding of the video and audio data, formats and converts the EPG and additional information of the digital television information to make the signals agree with the mobile communication network.

The converted digital video and audio data information are provided to a MTSO (System Controller and Switch) 108 through a transmission line 109. The MTSO 108 provides a signal for answering a request from a subscriber to the format converter 105 through a transmission line 110, allots the digital video and audio information to a certain channel of the mobile communication network, and transmits the digital information as a RF frequency to a subscriber terminal 112

through a base station.

As described above, the video and audio signal of the television broadcasting system 101 are converted into the signal agreed with the mobile communication network, and are transmitted to the subscriber terminal 112.

5 Accordingly it is possible to watch the television broadcasting on the subscriber terminal (cellular phone, PCS, IMT-2000 terminal).

Figure2 is a block diagram illustrating the operation of the broadcasting service system using the mobile communication terminal of the present invention, it depicts the preferred embodiment of the system including the format converter 105 and the server (MTSO) 108 and the base station 111.

When a moving picture information is the digital television broadcasting system, a television reception unit 201 receives the additional information including the digital video, audio information and the EPG (Electronic Program Guide) data agreed with the digital television broadcasting system, and transmits the MPEG2 (Moving Picture Experts Group2) signal to a transcoder 202. The television reception unit 201 abstracts the EPG (electronic Program Guide) data and transmits it to a EPG converting unit 203, and abstracts the additional data and transmits it to a additional data converting unit 204.

The transcoder 202 converts the inputted MPEG2 (Moving Picture Experts Group2) digital video and audio data into the MPEG4 (Moving Picture Experts Group4) digital video and audio data, and transmits it to a channel multiplexer 205.

As the digital video data transmission medium are diversified, and the characters of each medium are different, accordingly there is a need to make bit rate and converting method of the digital image agree with the medium character during the transmission.

In particular, the system of the present invention provides the digital television broadcasting signal to the mobile communication terminal such as the cellular phone or PCS through the mobile communication network, accordingly transcoding for converting the compressed bit is adapted in order to transmit the digital video data to the medium having different band.

The EPG converting unit 203 decodes the inputted MPEG2 EPG data, and converts it into the MPEG4 EPG data.

The additional data converting unit 204 decodes the inputted MPEG2 additional data into the MPEG4 additional data.

The EPG and additional data can be converted into the data agreed with a wireless internet network.

The channel multiplexer 205 puts the MPEG4 video and audio data provided from the transcoder 202 on a certain allotted channel, at the same time puts the EPG data outputted from the EPG converting unit 203 and the additional data outputted from the additional data converting unit 204 on a certain allotted channel.

The MPEG4 (Moving Picture Experts Group4) digital television video, audio, EPG (electronic Program Guide) and additional information converted in accordance with the character of the mobile communication network by passing through the above process are transmitted to the subscriber mobile communication terminal through a RF (Radio Frequency) reception unit 206.

Herein, the RF reception unit 206 is corresponding to the server (MTSO) or base station of the mobile communication network.

In SD level of the MPEG2 (Moving Picture Experts Group2), 6Mbps band is required, in HD level, about 19Mbps band is required, when the MPEG2 is

converted into the MPEG4 (Moving Picture Experts Group4), moving picture can be transmitted as about 64Kbps bit rate. Herein, the moving picture can be transmitted by being allotted a part of the IMT-2000 band as a television broadcasting band.

5 Meanwhile, when moving picture information is transmitted as a packet in order to transmit the moving picture information through exclusive broadcasting channel (transmission line), in consideration of the character of the mobile communication network, a voice band is changeable on one base station in accordance with a subscriber telephone call quantity, at this time television
10 broadcasting information should not be taken all band, accordingly a band controlling method for changeable band allotment is required.

 When a BW-video means moving picture (including sound) band for the digital television broadcasting and a BW-audio means audio band for voice communication of the mobile communication terminal, the size of the audio band
15 changes from 0 to maximum BW-audio in accordance with the voice telephone call quantity.

 Accordingly, the channel multiplexer 205 provides voice telephone call quantity information to a transmission rate control unit 207 in accordance with the voice telephone call quantity, the transmission rate control unit 207 controls
20 encoding rate of the MPEG4 (Moving Picture Experts Group4) of the transcoder 202 by using the provided information from the channel multiplexer 205.

 In addition, as described above, the digital television broadcasting can service not only the video and audio information, but also additional information, the additional information is provided to a subscriber through the additional
25 information converting unit 204 and channel multiplexer 205.

Figure 3 is a block diagram illustrating the preferred embodiment of the format converter of the present invention, it shows the construction of the format converting system which comprises a transcoder, a EPG (Electronic Program Guide) data converting unit and a data service converting processor.

Herein, a format converter 302 for converting the signal inputted from the television broadcasting system 101 301 into the signal agreeable to a mobile communication network 303 includes an A/V stream transcoder 304 which receives an A/V stream from the television broadcasting system and converts it into the format agreed with the mobile communication network, an EPG converting processor 305 which receives an EPG (Electronic Program Guide) stream from the television broadcasting system and converts it into the format agreed with the mobile communication network, and a data service converting processor 306 which receives a data stream from the television broadcasting system and converts it into the format agreed with the mobile communication network.

First, the A/V stream transcoder 304 converts the MPEG2 (Moving Picture Experts Group2) digital video (including audio) information into the MPEG4 (Moving Picture Experts Group4) or H.26L, H.263, H.26X format, and provides it to the mobile communication network 303. Herein, the converted digital video data can be provided to the subscriber in accordance with a subscriber request (A/V RQ) of the mobile communication network 303.

The EPG converting processor 305 converts the MPEG2 EPG stream inputted from the television broadcasting system into the signal agreed with the mobile communication network.

Figure 4 is a block diagram illustrating the embodiment of the EPG converting processor of the present invention. As depicted in figure 4, the EPG

converting processor 305 inputs the EPG information inputted from a PSIP (Program Stream Internet Protocol) table, performs format-decoding, abstracts needed information such as transmission rate of program or bit by filtering the format-decoded information, format-converts the abstracted information, and
5 constructs it in order to satisfy a wireless data protocol.

Herein, format-conversion in WAP (wireless Application Protocol), PSIP (Program Stream Internet Protocol) text is converted into HDML (Handheld device Mark-up Language) or TTML (Tagged Text Mark-up Language). In format-conversion in wireless data protocol, the PSIP is converted into HDTP (Handheld
10 Device Transport Protocol) or ITTP (Intelligent Terminal Transfer Protocol).

As depicted in figure 4, it illustrates an EPG analysis unit 401, an EPG answering control unit 402, a schedule data base 403, and a protocol converter 404.

First, the EPG analysis unit 401 analysis the inputted EPG guide stream
15 according to a encoded format, abstracts information in relation to channel and schedule of broadcasting programs, and stores the abstracted result on the schedule data base 403.

The schedule data base 403 records and stores the inputted information from the EPG analysis unit 401 on a memory, and checks and outputs a certain
20 information of the data base in accordance with a request from the EPG answering control unit 402.

The EPG answering control unit 402 operates in accordance with the EPG answering request (EPG RQ) from the subscriber through the server MTSO 303, searches the information corresponding to the subscriber request on the schedule
25 data base 403, and transmits it to the protocol converter 404.

The protocol converter 404 converts the data inputted from the EPG answering control unit 402 into a format agreed with the MTSO 303 and outputs it to the MTSO 303 for answering the subscriber request and being watched by the subscriber on the mobile communication terminal.

5 Meanwhile, the service converting processor 306 is inputted the additional information (data stream) from the television broadcasting system 301, converts it into a format agreed with the mobile communication network, and provides the information corresponding to the subscriber request (Data RQ).

10 In other words, the data service converting processor 306 performs the bit rate and protocol conversion process which converts the digital television broadcasting contents into the contents format agreed with the mobile communication network.

15 For example, the service information of the digital television broadcasting system is decoded by a MHEG-5 engine or XHTML browser, and the decoded information is converted into the signal and format agreed with the mobile communication network.

20 Herein, in the WAP conversion, Carousel/IP Datagram is converted into HDTP (High definition transport Protocol), and MHEG/XHTML (Multimedia and Hypermedia Expert Group/XHyper Text Markup Language) is converted into HDML (Handheld Device Mark-up Language).

Figure 5A is a block diagram illustrating the operation of the preferred embodiment of the digital broadcasting service system in relation to processing of video, audio and additional information and matching with the mobile communication network of the present invention.

25 As depicted in figure 5, the digital broadcasting system using the mobile

communication comprises a digital signal processing unit 501, a medium storing unit 502, a data processing/converting unit 503, and a transcoder/transmission unit 504. Its operation will be described in detail.

5 The digital signal processing unit 501 is a information program transmission unit which provides broadcasting program to the mobile communication network by receiving 19.2Mbps HD level and 6Mbps SD level multi-channel digital television signal.

10 The digital signal processing unit 501 selects the inputted digital television signal on a tuner 505, demodulates the selected signal on a demodulating unit 506, abstracts information in accordance with each broadcasting channel on a de multiplexer 507, reproduces and outputs the video and audio signal as the original digital television broadcasting signal by a MPEG decoder 508.

15 Herein, the MPEG TP de multiplexer 507 abstracts the data regardless of the format for providing PSI (Program System Information), guide information and additional information.

20 The medium storing unit 502 includes a MPEG recorder 502A, a MPEG file input/output unit 502B and a file filter 502C, it is a file system to make a disk scheduling and disk data block size agree with the MPEG stream for storing digital television broadcasting signal maximum 30Mbps level MPEG2 stream in real time. The medium storing unit 502 stores a stream such as the MPEG4 itself, and services it to the mobile communication network.

25 Herein, a striping method is used to store the MPEG2 transmission stream transmitted from the digital television broadcasting signal reception unit as a consecutive block unit. The transcoder 513 may support GOP unit, I-Frame Value on the file system in order to operate effectively a Bit Rate Drop, Macro Block and

Intra/Inter compensation.

A data processing/converting unit 512 includes an EPG decoder 509, a data decoder 510, a presentation engine unit 511, and a protocol converting unit 512. As described above, the data processing/converting unit 512 abstracts and
5 converts the EPG and additional information received from the digital television broadcasting for being used by a mobile communication terminal user.

The EPG decoder 509 abstracts and decodes the EPG data inputted from the digital signal processing unit 501.

The presentation engine unit 511 contents-format-converts the decoded
10 EPG data, and outputs it to the protocol converting unit 512.

Herein, as described above, the format conversion in the WAP (Wireless Application Protocol), PSIP(Program Stream Internet Protocol) text is converted into HDML(Handheld Device Mark-up Language) or TTML(Tagged Text Mark-up Language), and in the wireless data protocol, PSIP (Program Stream Internet
15 Protocol) is converted into HDTP Handheld Device Transport Protocol), ITTP (Intelligent terminal Transfer Protocol).

The data decoder 510 abstracts and decodes the additional service information from the inputted data.

In addition, the presentation engine unit 511 contents-format-converts the
20 decoded additional service information, and outputs it to the protocol converting unit 512.

Herein, in wireless internet WAP converting, Carousel/IP Datagram agrees with HDTP, and MHEG/XHTML agrees with HDML.

The protocol converting unit 512 converts the additional information
25 including the format-converted EPG data into a protocol agreed with the mobile

communication network, and outputs it.

The transcoder 513 converts the digital video(including audio) broadcasting signal inputted from the digital signal processing unit 501 into the signal agreed with the mobile communication network. For example, it can convert the MPEG2 into the MPEG4, and provides the converted digital video and audio data to a wireless stream processing unit 517 in accordance with transmission control of a transmission rate control unit 516.

Figure 5B is a block diagram illustrating the analog broadcasting service system in relation with processing of video, audio and additional information and matching with the mobile communication network. As depicted in figure 5B, the analog television broadcasting system using the mobile communication comprises an analog signal processing unit 518, the medium storing unit 502, the data processing/converting unit 503 and the transcoder/transmission unit 504. It will be described in detail.

The medium storing unit 502, data processing/converting unit 503 and transcoder/transmission unit 504 are same in figure 5A, description of the parts are abridged.

The analog signal processing unit 518 includes an analog broadcasting signal reception unit 519, an analog digital converting unit 520, a MPEG4 encoder 521, and a VBI abstraction unit 522. Herein, the analog signal processing unit 518 is information program transmission unit for receiving the analog television signal and providing the broadcasting program to the mobile communication network.

In addition, the analog signal processing unit 518 includes an analog broadcasting reception unit 519 which receives and restores the analog television signal, an analog digital converting unit 520 which converts the restored analog

broadcasting signal (including moving picture and audio information) into a digital data, a MPEG4 encoder 521 which converts the converted digital data into MPEG4 (Moving Picture Experts Group4) format and outputs it to the transcoder/transmission unit 504, and the VBI abstraction unit 522 which abstracts the EPG (Electronic Program Guide) data and additional data on the VBI section and provides it separately to the EPG decoder 509 and the additional data decoder 510.

Description of the operation of the above construction is same with description of figure 5A, and is abridged.

Accordingly, when the moving picture information is the analog television broadcasting signal, broadcasting service using the mobile communication is possible.

Figure 6 is a block diagram illustrating the operation of the transcoder of the present invention for converting the MPEG2 (Moving Picture Experts Group2) into the MPEG4 (Moving Picture Experts Group4).

As depicted in figure 6, when H.26L, H.263, H.26X are the digital video and audio data formats agreed with the mobile communication network, a construction of a circuit and algorithm for converting these formats is possible.

As described above, in order to transmit television broadcasting signal by using a wireless communication network in real time, the television broadcasting signal has to agree with the character of the wireless communication network. In other words, transcoding has to be performed between the different systems. Herein, in order to prevent video(image) deterioration due to the transcoding, a certain pertinent transcoding method can be selected between wide-spread transcoding methods.

In addition, not passing through the transcoding, transmitting digital television broadcasting information is possible by using the digital compressed algorithm such as MPEG4 (Moving Picture Expert Group4) or H.263.

The circuit of figure 6 includes a decoder unit 601 which is inputted the MPEG2 (Moving Picture Experts Group2) bit stream and decodes it, and encoder unit 602 which encodes the decoded restoration digital video data into the MPEG4 (Moving Picture Experts Group4) bit stream, its operation will be described in detail.

First, the decoded video data on a variable signal decoder 603 of the decoder unit 601 is converted into reverse quantization and IDCT (Inverse Discrete Cosine Transform) through a reverse quantization unit 604 and IDCT Inverse Discrete Cosine Transform) unit 605. The converted reverse quantization and IDCT are decoded perfectly by passing through motion compensation process of the output device including an adder 606, a memory 607 and a motion compensation unit 608.

The encoding unit 602 encodes the restored digital video data according to quantization step which is different with the above decoding quantization step (in the present invention, the MPEG2 (Moving Picture Experts Group2) is converted into the MPEG4 (Moving Picture Experts Group4), quantization step of the encoder is larger than quantization step of the decoder), the digital compressed video data coated with the MPEG4 is outputted.

In order to compress and process the digital video data, the encoder unit 602 discrete-cosine-converts the difference between inputted video and restored video outputted through an adder 609, a DCT (Discrete Cosine Transform) unit 610 outputs it, a quantization unit 611 makes the signal inputted from the DCT unit

610 quantized, a variable signal encoder 612 converts the quantized signal into the MPEG4 bit stream and outputs it, the outputted data from the quantization unit 611 is restored through the reverse quantization unit 613 and IDCT (Inverse Discrete Cosine Transform) unit 614, the balance between the restored video data and the inputted video data of the adder 609 is calculated by passing through the motion compensation process of the adder 615, memory 616 and a motion compensation unit 617, the calculated balance is discrete-cosine-transformed and quantized.

Accordingly, the transcoded data by the above process is inputted to a transmission rate control unit 516 in figure 5A, 5B, is controlled as transmission rate agreeable to the mobile communication network, and is inputted to a wireless network stream processing unit 517.

Meanwhile, a wireless network data protocol processing unit 515 designates a data protocol agreeable to the mobile communication network such as a HDTP (High Definition Transport Protocol) or a ITTP (Intelligent Terminal Transfer Protocol) on the WAP (Wireless Application Protocol) to the EPG (Electronic Program Guide) data and additional data outputted from the protocol converting unit 512 of the data processing/converting unit 503.

When the mobile communication terminal requires a search for a certain broadcasting schedule by sending a key word such as an program title or an actor name, the wireless network data protocol processing unit 515 supports the data base of the presentation engine unit 511 to search easily the program schedule or the program concept.

The medium synchronization control unit 514 reconstructs the transcoded video and audio data by the transcoder 513 and the converted data by the data

processing/converting unit 503, and provides the data which does not require synchronization directly to the wireless stream processing unit 517.

In other words, the medium synchronization control unit 514 resynchronizes the lost synchronization information of the synchronized broadcasting data with the closest video and audio data through the transcoder 513.

As described above, the reconstructed digital video, audio and additional information agreed to the mobile communication network are inputted to the wireless stream processing unit 517.

The wireless stream processing unit 517 transmits the moving picture and data to pertinent channel of the mobile communication network in real time, performs channel allot or cancel in relation to the digital television signal transmission for answering request of the subscriber.

Figure 7 is a block diagram of the preferred embodiment of the mobile communication terminal of the present invention, it describes the construction of the mobile communication terminal receiving the television signal transmitted from the mobile communication network. Its construction and operation will be described in detail.

First, a RF reception and transmission unit 702 receives and transmits the base station communication signal received from an antenna 701 and the signal for voice telephone call communication, and receives the television broadcasting signal transmitted to pertinent call channel.

In the voice telephone call communication, a voice encoding and decoding unit 703 duplicates the received voice signal of the opponent caller received from the RF reception and transmission unit 702, and outputs it to a voice processing

unit 706.

The voice processing unit 706 outputs the duplicated voice signal to a speaker SP, encodes the duplicated voice signal through a microphone MIC of the subscriber, and transmits it to the RF reception and transmission unit 702.

5 A video encoding and decoding unit 704 performs a MPEG4 decoder function. In the preferred embodiment of the present invention, the MPEG decoder is included in order to reproduce the transcoded MPEG4 (Moving Picture Experts Group4) video data which is transmitted through the mobile communication network, but a H.263 codec may be included in the IMT-2000 in accordance with
10 circumstance of the mobile communication network.

Accordingly, in order to process moving picture information as a format agreed with the mobile communication network, various encoding standard codec can be included.

15 In the television broadcasting reception mode, the video encoding and decoding unit 704 receives the MPEG4 (Moving Picture Experts Group4) digital video signal inputted from the RF reception and transmission unit 702, restores it, and outputs the restored television video signal to a monitor 708 through a video processing unit 707.

20 In the mobile communication system having two-way monitor communication function, a camera 705 transmits a signal having the photographed subscriber image by passing through the video processing unit 707, video encoding and decoding unit 704, and RF reception and transmission unit 702.

25 A processor 709 having the voice telephone call mode and television reception mode controls the each construction unit in accordance with the mode, reads information on a memory unit 710, and stores information on the memory

unit 710.

A key input unit 711 has designated keys for the television reception with a key input function for telephone calls.

Figure 7 is a block diagram illustrating the operation of the mobile communication terminal of the present invention, when the television broadcasting signal is converted into the signal agreed with the mobile communication network, the mobile communication terminal receives it, restores it into video and audio, and outputs it.

However, as described above, when the RF reception and transmission unit 702 includes a TV tuner, although the television signal is not converted into a signal agreed with the signal transmission standard of the mobile communication network, the mobile communication terminal of the present invention can receive the analog or digital television broadcasting signal, restores it and outputs it.

Herein, in the subscriber mobile communication terminal which receives the analog television broadcasting signal, the RF reception and transmission unit 702 performs a tuner function which receives the analog television broadcasting signal from the antenna 701 and selects it, the voice processing unit 706 processes the voice signal of the selected channel broadcasting signal of the RF reception and transmission unit (hereinafter referred to tuner) 702, and the video processing unit 707 processes the video signal of the selected channel broadcasting signal, and outputs it to the monitor 708 in order to display.

As described above, the subscriber mobile communication terminal receiving the analog television broadcasting signal includes the antenna, the tuner, the video and audio processing unit, in figure 7, the video and audio encoding and decoding unit can be excluded. As for the antenna, speaker, and monitor of the

above construction, the antenna, speaker, and monitor of the conventional cellular phone, PCS, and IMT-2000 terminal can be used.

Meanwhile, in the subscriber mobile communication terminal, the RF reception and transmission unit (tuner) 702 receives the digital television broadcasting signal from the antenna 701 and selects it, the voice decoding unit 706 outputs the restored voice signal to the speaker SP, the video decoding unit 704 restores the video signal of the selected digital broadcasting signal, and the video processing unit 707 processes the restored video signal and outputs it to the monitor for displaying.

As described above, the subscriber mobile communication terminal includes decoding mean which decodes the digital video and audio signal, the antenna, speaker and monitor of the conventional PCS, cellular phone and IMT-2000 terminal can be used as it is.

Figure 8 is a flow chart illustrating the control operation of the broadcasting service of the present invention, it shows a certain process for the receiving television signal between the terminal of figure 7 and the broadcasting service system using the mobile communication of the present invention.

In figure 7 and figure 8, operations will be described. The EPG data is transmitted to the subscriber for answering the subscriber request, the format-converted signal based on the EPG data is transmitted to the subscriber in accordance with the subscriber select program through the allotted channel.

At the same time, a bill is demanded to the subscriber, it is assumed the subscriber has right to watch the digital television broadcasting. It is also assumed a mobile communication company has a designated telephone number to handle subscriber requests and also performs key word certifying process for confirming

the subscriber.

First, when the mobile communication terminal subscriber wants to receive the digital television broadcasting through the subscribed mobile communication network, the subscriber sets up the TV reception mode by using the key input unit
5 711, and connects to the designated telephone number of the mobile communication company.

After the connection completion, the subscriber is confirmed whether the certified subscriber having the right for receiving the digital television broadcasting by inputting the pass word.

10 When the subscriber is certified, access is granted, the pertinent channel for watching moving picture is allotted

After that, the server MTSO requires the EPG data to the format converter.

As an answer for the EPG data request, the format converter provides the EPG data packet to the server MTSO. The server MTSO transmits the EPG data
15 packet to the subscriber through the pertinent channel.

Herein, the EPG data packet can have the format agreed with the wireless internet network.

The EPG data packet received on the antenna 701 is decoded on the video encoding and decoding unit 704 through the video processing unit 707, the
20 decoded result shows on the monitor 708 through the video processing unit 707. The subscriber answers it by searching the EPG data, and selects a channel.

In order to make possible the subscriber search, a web browser mean is provided on the terminal (processor) for searching the EPG and additional information.

25 The channel select information is inputted to the processor 709 through

the key input unit 711, the processor 709 coding-controls the pertinent signal and transmits it to the server through the RF reception and transmission unit 702 and antenna 701.

The server MTSO requires the video and audio data corresponding to the selected channel by the subscriber to the format converter, the format converter outputs the video and audio data, and transmits it to the subscriber through the mobile communication network.

In order to watch the television broadcasting by using the mobile communication network, the transmitted television broadcasting signal is provided to the video encoding and decoding unit 704 through the antenna 701 and RF reception unit 702. As described above, the video encoding and decoding unit 704 performs the MPEG4 decoder function, accordingly decodes, outputs the video and audio to the monitor 708 and speaker SP through the each processing unit 707, 706.

Meanwhile, after the subscriber certification, the server can perform payment demand by using the subscriber certification key word such as an ID.

Herein, the television broadcasting signal transmission to the certain channel (changeable channel) opened and continued between the server and subscriber is described, but as described above, it is also possible to perform the television system using the mobile communication of the present invention by allotting a certain channel for the television broadcasting.

As described above in detail, the present invention is capable of watching moving picture by using the mobile communication network, watching the television broadcasting by using the mobile communication terminal, transmitting the EPG data for answering the subscriber request, and providing the selected

broadcasting program from the data to the subscriber in a real time.

In addition, the subscriber can choose the television broadcasting and watch by using the mobile communication terminal such as the cellular phone, PCS, and IMT2000.

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What is claimed is :

1. A broadcasting service system using a mobile communication terminal, comprising :

5 a converting mean which converts a video and audio signal provided from a moving picture information into a format agreed with a signal and transmission standard of a mobile communication network ; and

a transmitting mean which transmits the converted video and audio signal to a subscriber through a certain transmission channel of the mobile communication network.

10 2. The broadcasting service system according to claim 1, wherein the video and audio information agrees with a first signal standard for a television broadcasting, the converted digital video and audio information agreeable to the mobile communication network agrees with a second signal standard, and the first and second signal standard agree with a signal standard which is capable of converting between different systems.

15 3. The broadcasting service system according to claim 2, wherein the first signal standard agrees with a MPEG2 (Moving Picture Experts Group2), the second signal standard agrees with a MPEG4 (Moving Picture Experts Group4), H.26L, H.263, and H.26X.

20 4. The broadcasting service system according to claim 1, wherein the converting mean includes a coding mean which codes the digital video and

audio data agreeable to the digital television broadcasting system and formats the coded video and audio data agreeable to the mobile communication network transmission, and a converting-controlling mean which convert-controls a transmission rate for agreeing with the transmission rate of the mobile communication network.

5. The broadcasting service system according to claim 1, wherein the converting mean includes a digital signal converting mean which converts an analog television broadcasting signal into a digital signal, a coding mean which formats the converted broadcasting signal having moving picture and audio and codes it, and a converting-controlling mean which convert-controls transmission rate in order to agree with the transmission rate of the mobile communication network.

6. The broadcasting service system according to claim 1, wherein the transmitting mean includes a putting mean which puts the formatted digital video and audio data on a transmission channel, and a formatting-transmission mean which formats and transmits the digital video, audio data with additional broadcasting information.

7. The broadcasting service system according to claim 1, wherein the EPG (Electronic Program Guide) data is formatted and transmitted with the video, audio signal and additional information.

8. The broadcasting service system according to claim 1, wherein the

transmitting and converting means transmit data through a connected transmission channel between a mobile communication subscriber and a base station.

5 9. The broadcasting service system according to claim 1, wherein the converting and transmitting mean allot at least one transmission channel on the mobile communication network, and transmit the video and audio signal through the allotted channel.

10 10. The broadcasting service system according to claim 1, wherein the television broadcasting service system using the mobile communication includes a identifying mean which identifies a subscriber subscribed the television video and audio signal between mobile communication subscribers, and a payment demanding mean which demands a payment corresponding to a reception of the
15 video and audio signal to the identified subscriber.

 11. A mobile communication terminal, comprising :
a digital video and audio data reception mean ;
a decoding mean which decodes the received digital video and audio
20 data ; and
an outputting mean which outputs the decoded video and audio signal.

 12. The mobile communication terminal according to claim 11, wherein the mobile communication terminal includes a receiving-decoding mean which
25 receives and decodes the EPG (Electronic Program Guide) signal from the

television signal transmitted from the mobile communication network, and a transmitting mean which transmits a subscriber search answer of the decoded EPG (Electronic Program Guide) data to the service system.

5 13. The mobile communication terminal according to claim 11, wherein the mobile communication terminal is one of a cellular phone , PCS terminal, or IMT-2000 terminal.

10 14. The mobile communication terminal according to claim 11, wherein the mobile communication terminal includes a web browser mean for searching the EPG data and additional information transmitted from the mobile communication network.

15 15. A broadcasting service system using a mobile communication terminal, comprising :

 a digital video and audio input mean which is provided a digital video and audio signal from a provider of the pertinent information ;

20 a transcoding mean which converts the digital video and audio signal inputted from the digital video and audio input mean into a format and transmission rate agreeable to the mobile communication network ; and

 a transmitting mean which puts the transcoded-converted digital broadcasting signal on a certain allotted channel of the mobile communication network, and transmits it.

25 16. The broadcasting service system according to claim 15, wherein

the broadcasting service system includes a EPG (Electronic Program Guide) data converting mean which converts the EPG (Electronic Program Guide) data for selecting the digital broadcasting channel into a format agreeable to the mobile communication network, and a additional information converting mean which
5 converts the additional information of the digital broadcasting into a format agreeable to the mobile communication network.

17. The broadcasting service system according to claim 16, wherein the broadcasting service system transmits the EPG (Electronic Program Guide)
10 data and additional information as the agreeable format to the mobile communication network.

18. The broadcasting service system according to claim 16, wherein the EPG (Electronic Program Guide) data converting mean includes a decoding
15 mean which decodes the inputted EPG (Electronic Program Guide) stream of the digital broadcasting, a restoring mean which restores the inputted EPG (Electronic Program Guide) stream of the digital broadcasting, a data base mean which stores a information corresponding to the restored EPG (Electronic Program Guide) data, an EPG (Electronic Program Guide) information outputting mean which outputs
20 the EPG (Electronic Program Guide) information from the data base corresponding to a subscriber request, and a converting mean which converts the additional information of the digital broadcasting into a format agreeable to the mobile communication network.

19. A broadcasting service system using a mobile communication

terminal, comprising :

a digital signal processing mean for receiving the digital broadcasting signal and providing a broadcasting program to the mobile communication network ;

5 a medium storing mean for storing the broadcasting information processed by the digital signal processing mean ;

a data processing and converting mean for converting the EPG (Electronic Program Guide) data and additional information processed by the digital signal processing mean into a signal format agreed with the mobile communication network ; and

10 a transcoder and transmission mean for receiving the video, audio data and additional information processed by the digital signal processing mean and converting it into a signal format agreeable to the mobile communication network and outputting it.

15 20. The broadcasting service system according to claim 19, wherein the digital signal processing mean includes a tuner for selecting the digital broadcasting signal inputted through a transmission medium such as a television broadcasting, satellite broadcasting and cable broadcasting, a demodulating mean for restoring the selected digital broadcasting signal, a de multiplexer for fetching the EPG and additional information from the demodulated digital broadcasting signal, and a decoder for decoding the video and audio signal from the demodulated digital broadcasting signal.

25 21. The broadcasting service system according to claim 19, wherein

the data processing and converting mean includes a EPG (Electronic Program Guide) data decoding mean for decoding the EPG (Electronic Program Guide) data of the digital broadcasting, a signal converting mean for converting the decoded EPG (Electronic Program Guide) data into a signal format agreed with the mobile communication network, a protocol converting mean for converting the converted EPG (Electronic Program Guide) data into a protocol agreed with the mobile communication network, a decoding mean for decoding the additional information of the digital broadcasting, an additional information signal converting mean for converting the decoded additional information into a signal format agreed with the mobile communication network, an additional information protocol converting mean for converting the converted additional information into a protocol agreed with the mobile communication network.

22. The broadcasting service system according to claim 19, wherein the transcoder and transmission mean includes a transcoder for transcoding the digital broadcasting video, audio signal into a format agreed with the mobile communication network, a transmission rate control mean for controlling the transcoder transmission rate agreeable to the mobile communication network, a converting mean for converting the output of the data processing and converting mean into a data protocol agreeable to the mobile communication network, a synchronization processing mean for synchronizing synchronization request information during the transcoding and protocol converting, and a transmitting mean for transmitting the processed data in real time by allotting it on the certain channel of the wireless communication network

23. A broadcasting service method using a mobile communication terminal, comprising :

converting a broadcasting signal including digital video and audio data into a format agreed with a signal and transmission standard of the mobile communication network ; and

transmitting the converted digital video and audio data to a subscriber through a certain transmission channel of the mobile communication network.

24. The method according to claim 23, wherein the converting process includes the steps of :

(a) converting a video and audio data of the digital broadcasting signal into the data agreeable to the standard and transmission rate of the mobile communication network ; and

(b) converting the EPG (Electronic Program Guide) data and additional information into the information agreeable to the standard and transmission rate of the mobile communication network.

25. The method according to claim 23, wherein the transmission process includes the steps of :

(a) synchronization controlling the synchronization request information of the converted digital video and audio data, EPG (Electronic Program Guide) data and additional information ;

(b) converting the data into a protocol agreeable to the mobile communication network ; and

(c) allotting a certain transmission channel and putting the digital data

corresponding to the protocol of the mobile communication network on the certain transmission channel.

26. A broadcasting service method using a mobile communication
5 terminal, comprising :

transmitting the EPG (Electronic Program Guide) data to a subscriber through the mobile communication network when there is a broadcasting service request from the subscriber ;

10 selecting a channel by searching the transmitted EPG (Electronic Program Guide) data :

converting the video and audio data of the selected channel into the data agreed with the standard of the mobile communication network ; and

15 transmitting the converted data through the certain transmission channel of the mobile communication network.

27. The method according to claim 26, wherein a right for watching the digital broadcasting is granted to a subscriber, and the EPG (Electronic Program Guide) information is provided to the subscriber after confirming and certifying the right.

20 28. The method according to claim 26 or claim 27, wherein an ID is granted to the mobile communication subscriber, and a payment for the digital broadcasting service is required to the subscriber by identifying the ID.

25 29. A broadcasting service system using a mobile communication

terminal, comprising :

an analog broadcasting reception mean which receives an analog television broadcasting signal ;

a digital converting mean which converts the analog broadcasting signal received by the analog broadcasting reception mean into a digital signal ;

an encoding-converting mean which converts the digital broadcasting signal converted by the digital converting mean into a signal agreed with the mobile communication network ; and

an allotting-transmitting mean which allots the converted digital broadcasting signal by the encoding-converting mean on the certain transmission channel of the mobile communication network and transmits it.

30. The system according to claim 29, wherein the system includes a EPG (Electronic Program Guide) signal and additional information abstracting mean for abstracting the EPG (Electronic Program Guide) signal and additional information, and an encoding-converting mean for converting the abstracted EPG (Electronic Program Guide) signal and additional information into a signal agreed with the mobile communication network.

31. The system according to claim 29 or claim 30, wherein the encoding-converting mean encodes the analog/digital converted broadcasting signal into a format agreed with the mobile communication network such as a MPEG4 (Moving Picture Experts Group4), H.26L, H.263 and H.26X, and puts it on the transmission channel.

32. A mobile communication subscriber terminal, comprising :

a broadcasting reception mean which receives a broadcasting signal as a moving picture information ;

a communication processing mean which receives a call signal provided to the subscriber through the mobile communication network and restore-outputs the call signal, and coding-outputs a subscriber call signal through the mobile communication network ;

a decoding mean which restores the received broadcasting signal by the broadcasting reception mean ;

an outputting mean which outputs the restored broadcasting signal by the decoding mean for being watched on the mobile communication terminal ; and

a selecting mean for selecting the broadcasting signal reception mode and a mobile communication telephone call mode.

33. The terminal according to claim 32, wherein the broadcasting reception mean includes an antenna and a tuner, the decoding mean includes a demodulation mean for demodulating a video and audio of the analog television broadcasting signal selected from the tuner, and the outputting mean includes a speaker for outputting the demodulated voice signal and a monitor for displaying the demodulated video signal when the television signal is the analog television broadcasting in order to watch the analog television broadcasting signal on the mobile communication terminal.

34. The terminal according to claim 32, wherein the broadcasting reception mean includes a bit stream reception mean for receiving the bit stream

from the terminal antenna and the digital broadcasting signal, the decoding mean includes a demodulation and restoring mean for demodulating the video and audio data of the digital television broadcasting signal and restoring the demodulated video and audio data, the outputting mean including the speaker for outputting the restored audio signal and the monitor for displaying the restored video signal when the broadcasting signal is the digital television broadcasting signal in order to watch the digital television broadcasting signal on the mobile communication terminal.

35. The terminal according to claim 32, 33 or 34, wherein the mobile communication subscriber terminal is one of a cellular phone, PCS terminal or IMT-2000 terminal.

ABSTRACT OF THE DISCLOSURE

The present invention relates to a system which is capable of receiving a television signal and telephone signal, and watching and listening it on a mobile communication terminal, in particular, is capable of watching each television broadcasting on a monitor of the mobile communication terminal by receiving the video and audio signal, decoding it, and displaying it on the monitor of the mobile communication terminal. The system can transmit an EPG (Electronic Program Guide) data corresponding to a subscriber request and a selected broadcasting program in real time.

FIG. 1

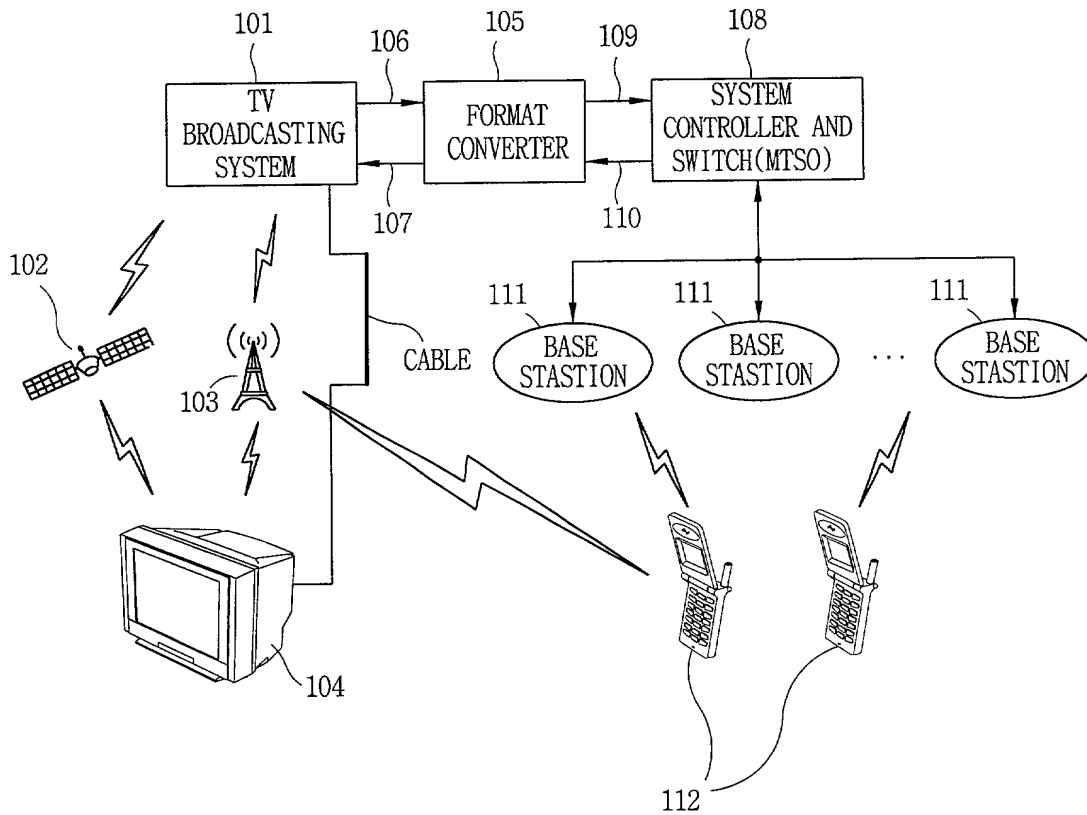


FIG. 2

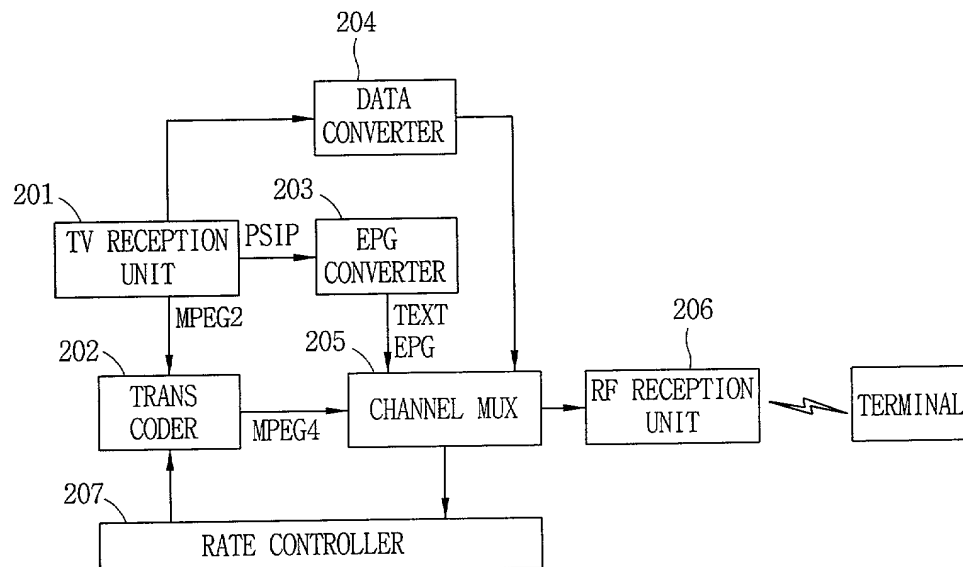


FIG. 3

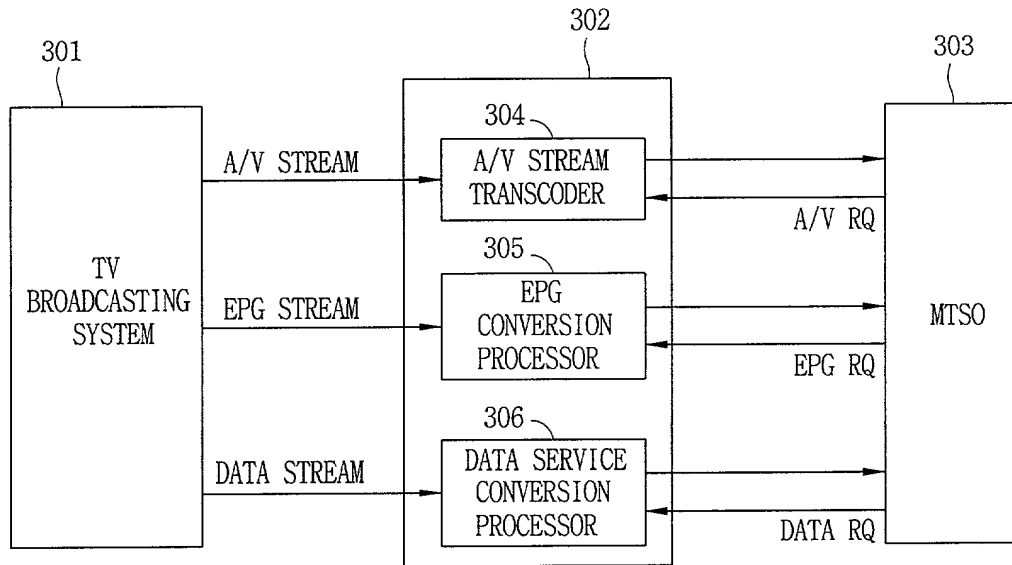


FIG. 4

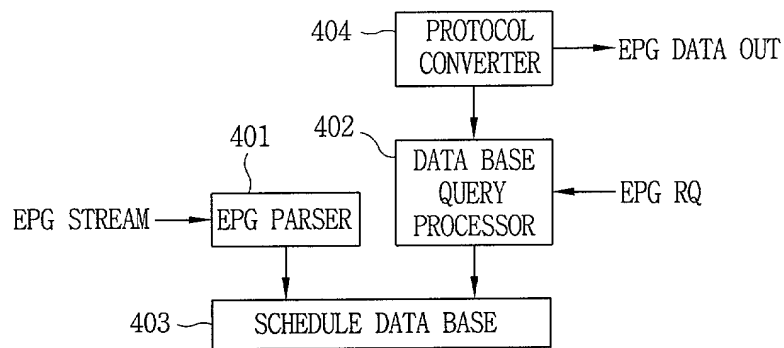


FIG. 5A

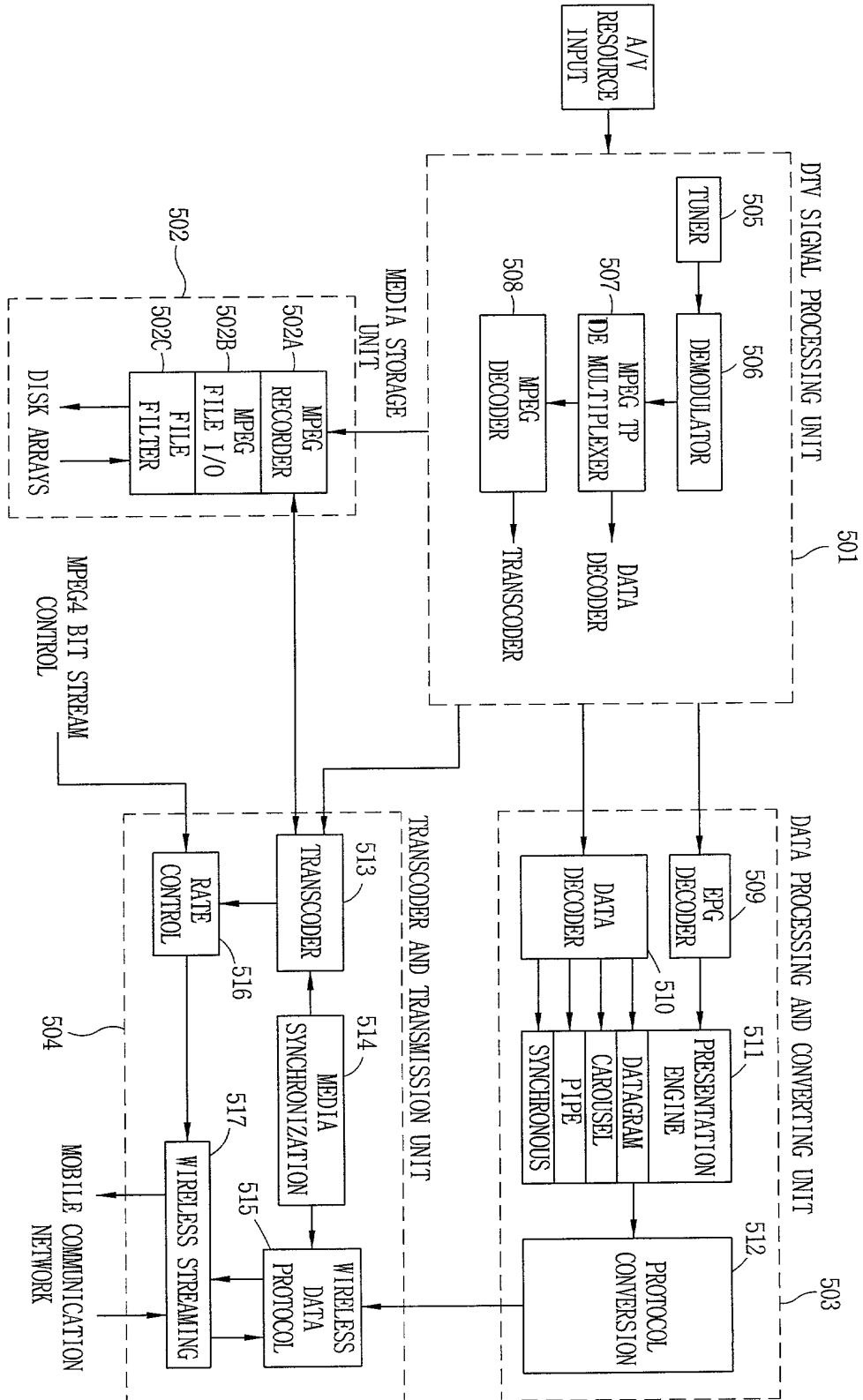


FIG. 5A is a block diagram of a system architecture for DTV signal processing and data conversion. The system includes a DTV Signal Processing Unit (501), a Data Processing and Converting Unit (503), and a Transcoder and Transmission Unit (504). The DTV Signal Processing Unit (501) receives an A/V Resource Input and processes it through a Tuner (505) and a Demodulator (506) to produce an MPEG TP (507). The MPEG TP (507) is then processed by a De Multiplexer (507) to produce Data Decoder output, which is then processed by an MPEG Decoder (508) and finally a Transcoder. The Data Processing and Converting Unit (503) receives data from the Transcoder and processes it through an EPG Decoder (509) and a Data Decoder (510). The output of the Data Decoder (510) is then processed by a Presentation Engine (511), which includes a Datagram Carousel Pipe and a Synchronous component. The output of the Presentation Engine (511) is then processed by a Protocol Conversion (512) block. The Transcoder and Transmission Unit (504) receives data from the Transcoder and processes it through a Transcoder (513) and a Rate Control (516) block. The output of the Rate Control (516) is then processed by a Wireless Streaming (517) block. The output of the Wireless Streaming (517) is then processed by a Wireless Data Protocol (515) block, which is connected to a Mobile Communication Network. Additionally, there is a Media Storage Unit that includes an MPEG Recorder (502A), an MPEG File I/O (502B), and an MPEG Filter (502C). The MPEG Recorder (502A) is connected to the Transcoder (513) and the Rate Control (516) block. The MPEG File I/O (502B) and MPEG Filter (502C) are connected to Disk Arrays. The MPEG Filter (502C) is also connected to the Wireless Data Protocol (515) block. The Disk Arrays are connected to the Wireless Data Protocol (515) block. The Wireless Data Protocol (515) block is also connected to the Mobile Communication Network.

FIG. 5B

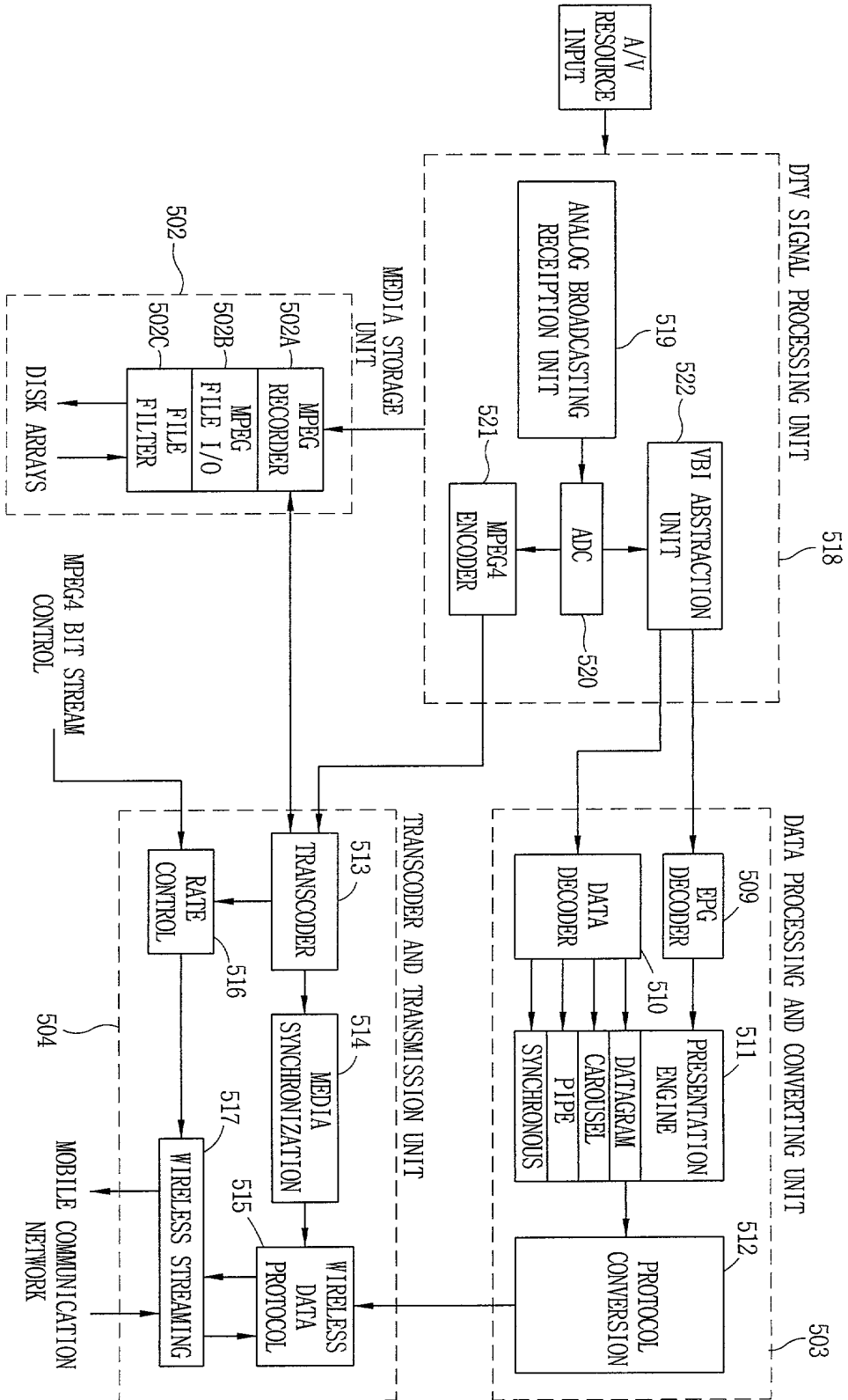


FIG. 6

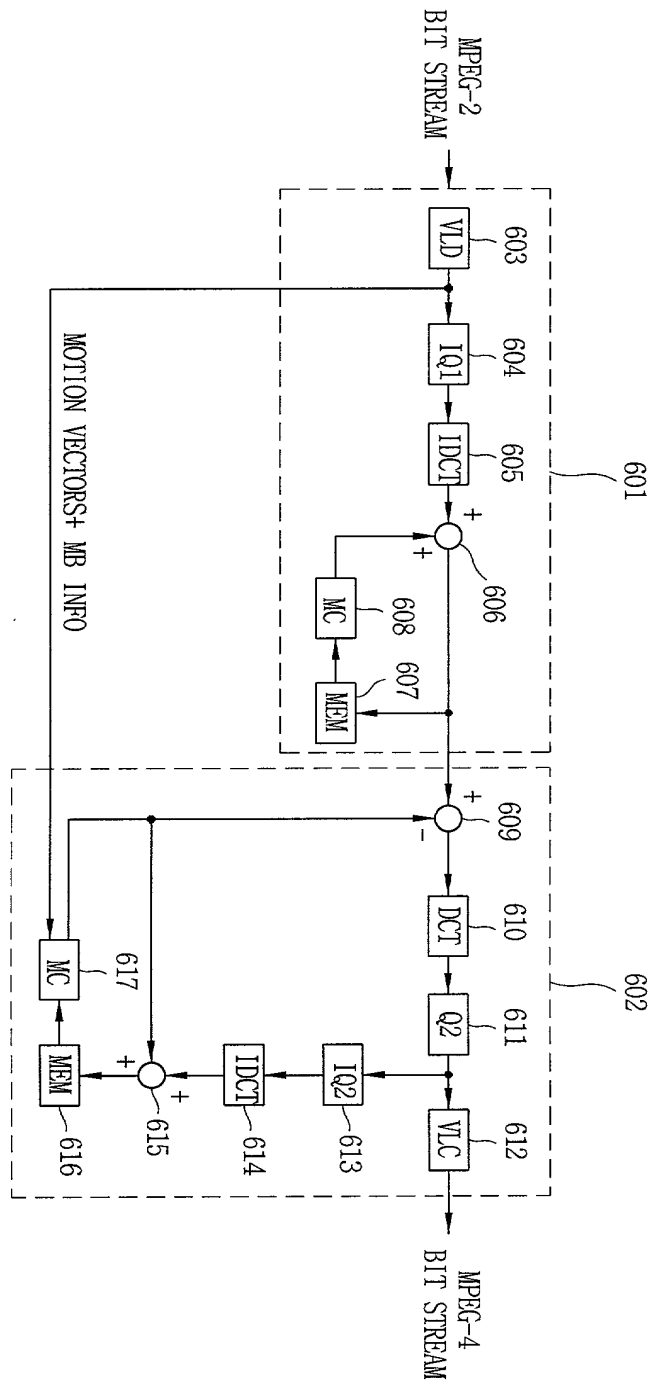


FIG. 7

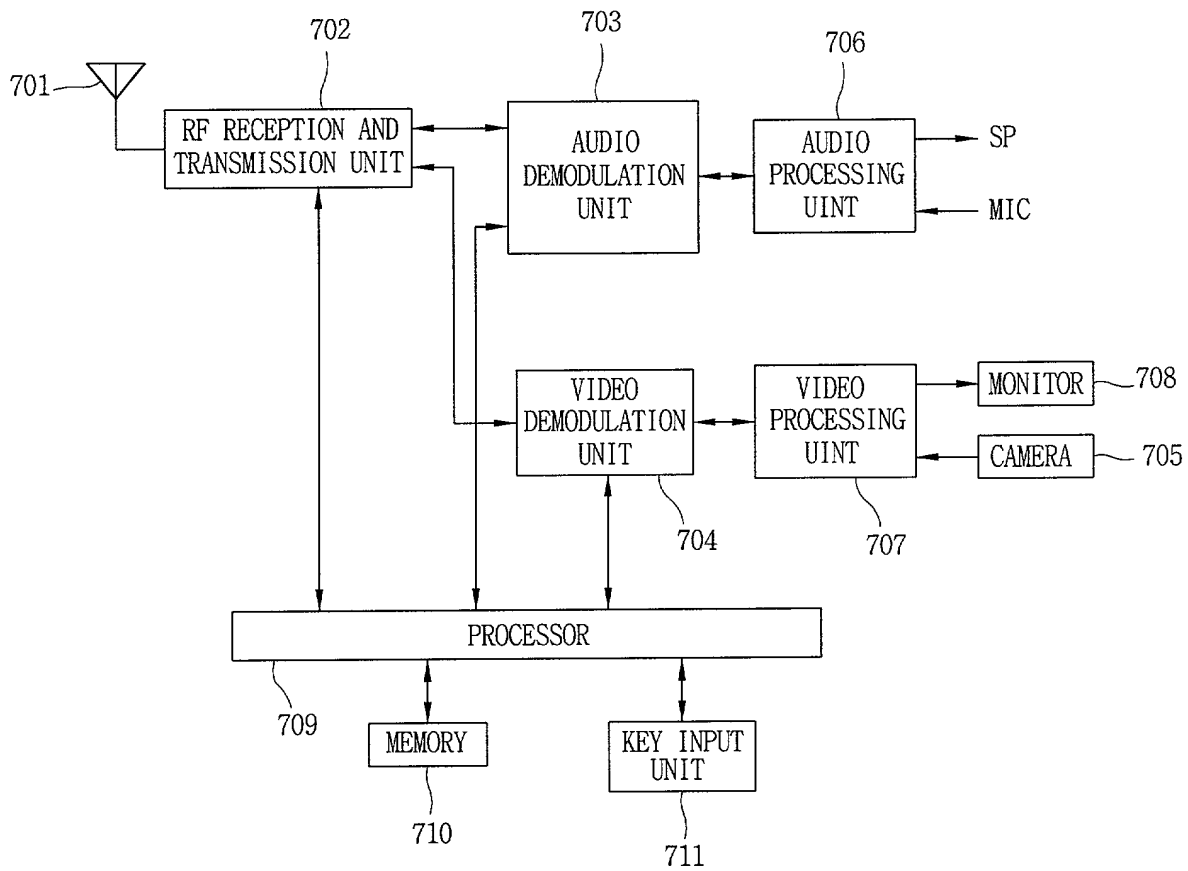
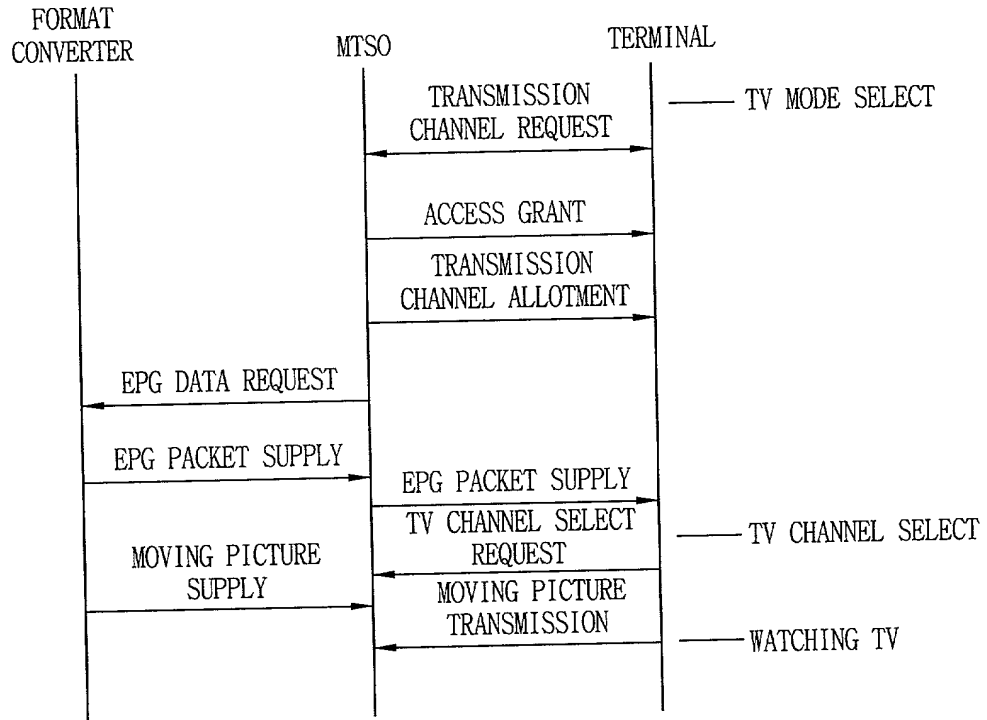


FIG. 8



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BROADCASTING SERVICE SYSTEM USING MOBILE COMMUNICATION TERMINAL

Fill in Appropriate
Information -
For Use Without
Specification
Attached:

the specification of which is attached hereto. If not attached hereto,

the specification was filed on _____ as

United States Application Number _____; and /or

the specification was filed on _____ as PCT

International Application Number _____; and was

amended under PCT Article 19 on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I do not know and do not believe the same was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (six months for designs) prior to this application, and that no application for patent or inventor's certificate on this invention has been filed in any country foreign to the United States of America prior to this application by me or my legal representatives or assigns, except as follows.

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Information:
(if appropriate)

Insert Priority Information: (if appropriate) → Prior Foreign Application(s)

28811/1999

Korea

07/16/1999

Priority Claimed

☒ Yes ☐ No

(Number)

(Country)

(Month/Day Year Filed)

(Number)

(Country)

(Month/Day Year Filed)

☐ Yes ☐ No

(Number)

(Country)

(Month/Day Year Filed)

☐ Yes ☐ No

(Number)

(Country)

(Month/Day Year Filed)

☐ Yes ☐ No

(Number)

(Country)

(Month/Day Year Filed)

☐ Yes ☐ No

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(Filing Date)

(Application Number)

(Filing Date)

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(if appropriate)

Country

Application No

Date of Filing (Month Day Year)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Insert Prior U.S.
Application(s):
(if any)

(Application Number)

(Filing Date)

(Status - patented, pending, abandoned)

(Application Number)

(Filing Date)

(Status - patented, pending, abandoned)

I hereby appoint the following attorneys to prosecute this application and/or an international application based on this application and to transact all business in the Patent and Trademark Office connected therewith and in connection with the resulting patent based on instructions received from the entity who first sent the application papers to the attorneys identified below, unless the inventor(s) or assignee provides said attorneys with a written notice to the contrary:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor:
Insert Name of Inventor
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Inventor, if any
see above

Full Name of Fifth
Inventor, if any
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GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Woo Hyun	PAIK	<i>Woo Hyun Paik</i>	7/4/2000
Residence (City, State & Country)		CITIZENSHIP	
Seoul, Korea		Republic of U.S.A.	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			
20, Yoido-Dong, Yongdungpo-Ku, Seoul, Korea			
GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Bae Guen	KANG	<i>Bae Guen Kang</i>	7/4/2000
Residence (City, State & Country)		CITIZENSHIP	
Seoul, Korea		Republic of Korea	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			
Sangkye Daelim Apt. 106-1308, Sangkye-Dong, Nowon-Ku, Seoul, Korea			
GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Tae Jun	PARK	<i>Tae Jun Park</i>	2000.7.4
Residence (City, State & Country)		CITIZENSHIP	
Seoul, Korea		Republic of Korea	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			
20-118, Soongin-Dong, Jongro-Ku, Seoul, Korea			
GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Seng Whan	LEE	<i>Seng Whan LEE</i>	2000.7.4
Residence (City, State & Country)		CITIZENSHIP	
Seoul, Korea		Republic of Korea	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			
Muhak Hyundai Apt. 102-201, Hawangshimni 2-Dong, Sungdong-Ku, Seoul, Korea			
GIVEN NAME	FAMILY NAME	INVENTOR'S SIGNATURE	DATE*
Residence (City, State & Country)		CITIZENSHIP	
POST OFFICE ADDRESS (Complete Street Address including City, State & Country)			